does not seriously reduce the clearance between the wing walls and those of the sides of the grooves because of their very slight vertical angularity.

This .001 inch clearance between the driver wing walls and the corresponding walls of the grooves is quickly taken up when driving torque is applied and the wings are forced against the driving walls of the recesses where they make their maximum frictional engagement at their greatest radius, thereby offering the best driving effort for both the metal of the screw head and that of the driver.

Axial thrust endeavoring to force a screw-driver out of the screw recess as a resultant of the driving torque is usually referred to as "throw-out" and is present in greater or less degree in most every type of screw recess and driver unless zero vertical angle is used on all engaging driving faces or the friction between the driver and recess walls is greater than the axial component of the driving torque. This throw-out is reduced in the present construction to the lowest factor consistent with good engineering principles and commercial operation as a result of the small included horizontal and vertical angles between the walls of the recess grooves and bit wings. The exactness of contact between these cooperating surfaces provides a considerable friction factor which serves to counteract the remaining component of axial thrust so that under extreme driving conditions where the friction is increased by the added torque the operator is not required to exert any considerable effort to retain the driver bit in the recess.

Most power screw-drivers are provided with a slipping clutch which may be adjusted to begin slipping before the driving torque is great enough to break the screw or to ream the recess, but unfortunately these clutches are subject to a number of variables so that they cannot always be given or maintain an exact setting. It is the tendency of the operators to set them to slip at too great a torque rather than too little to be sure of driving all screws completely home. The small amount of throw-out retained in the present combination of recess and driver bit is proper to overcome the difficulties explained at the beginning of this specification. Thus there is sufficient throw-out effort to force the driver clear of the screw recess on the application of excessive driving torque and thereby prevent reaming or marring of the recess and any damage to the driver blade.

If power screw drivers were perfect and clutches gave no trouble and the operators were always on the job, it would be possible to provide zero vertical angles in the recess grooves, but, where these have been tried, unsatisfactory results on assembly lines have always prevailed since the drivers were not thrown out in time to prevent spoiling of the screw or bit or both when the clutches failed to slip. The superior results achieved by the present construction are dependent upon the proven characteristics of the Phillips recess shape with changes including reducing the horizontal included angle of the groove walls from approximately 14° to an angle not greater than 4°, and the concomitant reduction of the vertical angle between the groove walls to not greater than 10°.

The improved recess and screw-driver bit are available for all types of screws, even those having the shallowest heads. The area of the wings eliminates the need of great depth of penetration and is so remote from the screw-axis as to materially decrease the unit pressure. This also increases the strength of the screw-head. The changed horizontal angle provides relatively large openings between the recess ribs increasing the ease of insertion of the bit, increases the bit life, locates the center of pressure on the wing farther away from the axis and materially decreases the possibility of burring at the mouth of the recess.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A screw having a socket extending into its upper end along its longitudinal axis and comprising a central portion and grooves radiating therefrom, the side walls of said grooves converging toward each other outwardly of the said central portion so that their intersections with a plane normal to said axis define an angle not greater than 4°.

2. A screw having a socket extending into its upper end along its longitudinal axis and comprising a central portion and grooves radiating therefrom, the side walls of said grooves converging toward each other outwardly of the said central portion so that their intersections with a plane normal to said axis define an angle not greater than 4° nor less than 2°.

3. A screw having a socket extending into its upper end along its longitudinal axis and comprising a central portion and grooves radiating therefrom, the side walls of said grooves converging toward each other outwardly of the said central portion so that their intersections with a plane normal to said axis define an angle not greater than 4°, said side walls also converging toward the opposite end of the screw such that their intersections with a plane parallel to the axis and transverse to the groove define an angle not greater than 10°.

4. A screw having a socket extending into its upper end along its longitudinal axis and comprising a central portion and grooves radiating therefrom, the side walls of said grooves comprising plane surfaces converging toward each other outwardly of said central portion at an included angle of substantially 8½°–10½°, the intersection of said surfaces with a plane normal to the said axis defining an angle not substantially less than 2° nor substantially greater than 4°.

5. A screw having a socket extending into its upper end along its longitudinal axis and comprising a central portion and grooves radiating therefrom, the side walls of said grooves comprising plane surfaces converging toward each other outwardly of said central portion, the line of intersection of said planes intersecting said axis at an angle of substantially 70°, the included angle between said plan s being such that torque applied by a screw-driver of complemental shape to said recess and of sufficient intensity to drive said screw under normal conditions of resistance does not produce a substantial throw-out force axially of the screw-driver.

6. A screw having a generally inwardly tapering recess extending into its upper end along its longitudinal axis, the walls of said recess comprising alternate ribs and grooves converging toward a concave bottom, each groove having tapered side walls and a tapered bottom wall and being of gradually increasing width from the outer edge thereof toward the axis, the intersection lines of the side walls with a plane normal